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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/673,889	09/29/2003	Richard A. Blanchard	GS 162 D1	1992
27774	7590	07/26/2005	EXAMINER	
MAYER, FORTKORT & WILLIAMS, PC 251 NORTH AVENUE WEST 2ND FLOOR WESTFIELD, NJ 07090			LE, THAO X	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 07/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

CM

Office Action Summary	Application No. 10/673,889	Applicant(s) BLANCHARD, RICHARD A.	
	Examiner Thao X. Le	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 14, 15 and 17-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 14, 15 and 17-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>09/29/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Terminal Disclaimer

1. The terminal disclaimer filed on 20 June 2005 disclaiming the terminal portion of any patent granted on this application, which would extend beyond the expiration date of US Patent 6479352 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 17 recites the limitation "dielectric" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 14-15 and 18-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6452230 to Boden in view of US 6608350 to Kinzer.

Regarding claim 14, Boden discloses a method of forming a power MOSFET in fig. 1 comprising the steps of: providing a substrate 11 of a first conductivity type (N); depositing an epitaxial layer 12 on the substrate, said epitaxial layer having a first conductivity type (N), column 2 lines 3-4; forming first and second body regions 15/16, column 2 line 17, in the epitaxial layer 12 to define a drift region therebetween, said body regions having a second conductivity type (P), fig. 1; forming first and second source regions 20/21, column 2 line 16, of the first conductivity type (N) in the first and second body regions 15/16, respectively; and forming a plurality of trenches 49/50/51, column 2 line 37, in said drift region of the epitaxial layer 12; depositing in said trenches a material 53, column 2 line 41, said trenches 49/50/51 extending toward the substrate from the first and second body regions 15/16;

But, Boden does not disclose epitaxially depositing in trenches a material having a dopant of the second conductivity type and diffusing at least a portion of said dopant from said trenches into portions of the epitaxial layer adjacent the trenches.

However, Kinzer discloses depositing in trenches a material 4, fig. 1, having a dopant of the second conductivity type, column 2 line 27, and diffusing at least a portion of said dopant from said trenches 3 into portions of the epitaxial layer 2 adjacent the trenches 2, fig. 1. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the layer 4

teaching of Kinzer to replace the material 53 of Boden, because the alternate N and P regions would have depleted out, allowing an almost uniform electric field distribution in the region between the trenches as taught by Kinzer, column 2 lines 64-67.

With respect to epitaxial depositing material, Kinzer discloses the layer 4 can be made with any suitable process, column 2 line 26. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to replace the teach of Boden and Kinzer with epitaxial silicon deposition in trench, because it would have produced the same structure as claimed and such epitaxial silicon method is well documented in the art, such as Beyer (4671851) in column 5 lines 50-5, Balasubramanian (6468853) in column 4 line 34, Sparks (5250461) in column 8 lines 3-5, Beyer (4924284) in column 4 line 15, or Beyer (4758531) in column 4 line 64.

Regarding claim 15, Boden discloses the method of claim 14 wherein said deposited material filling the trench includes silicon, column 2 line 40.

Regarding claim 18, as discussed in claim 14 Boden does not disclose the method wherein dopant is boron. But Kinzer discloses the P doped layer 4 that would comprise boron dopant.

Regarding claim 19, Boden discloses the method further comprising the step of at least partially oxidizing silicon, column 2 line 40.

Regarding claim 20, Boden discloses the method wherein material filling the trench includes silicon 48 and a dielectric 60, fig. 2.

Regarding claims 21-26, Boden discloses the method wherein body region include deep body region, fig. 1, wherein the trench is formed by providing a masking layer define by at least one trench, and etching the trench defined by the masking layer, column 49-55 and incorporated by reference US Pat 5549762, wherein said body region is formed by implanting and diffusing a dopant into the substrate, column 2 lines 9-15, wherein the epitaxially depositing step includes the step of epitaxially depositing a plurality of layers 11/12, at least two of said layers having different dopant concentrations, fig. 1, wherein said plurality of layers includes an interface layer 12 adjacent to one of the body regions 15/16, said interface layer having a lower dopant concentration than an interior layer of the epitaxially layered material 11, fig. 1, wherein said epitaxially layered material has a dopant concentration that is reduced in the vicinity of the body regions relative to the dopant concentration profile in the vicinity of the substrate, fig. 1.

Regarding claims 27-29, Boden discloses the method wherein said portions of the epitaxial layer 12 adjacent the trenches 49 have a substantially uniform dopant concentration in a direction lateral to the trenches, wherein said portions of the epitaxial layer 12 adjacent the trenches have a substantially uniform dopant concentration in a direction lateral to the trenches, and wherein a power MOSFET made in according with the method.

Boden and Kinzer discloses the device are identical or substantially identical in structure or composition, or are produced by identical or substantially

identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Response to Arguments

7. Applicant's arguments filed on 20 June 2005 have been fully considered but they are not persuasive.

a. The Applicant argues that Kinzer does not provide teaching or suggestion to use epitaxial silicon to fill the trenches. This is not persuasive because Kinzer disclose the P-type 4 in the trench 3 can be made with any suitable process, column 2 line 26. Such broad disclosure of Kinzer would have implicitly including the claimed limitation. And epitaxially depositing silicon and doping is one the way to create such layer in the trench. The Office provided several prior arts to substantiate such process.

b. With respect to SIPOS material and liner with high resistivity material, using trench of Kinzer having a P-type silicon layer to replace the trench of Boden would have obviously meet the claim limitation as discussed in the Office Action dated 12/20/04. And the Applicant has not provided any season such combination would be improper.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

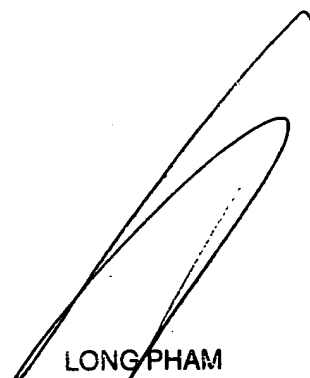
9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Art Unit: 2814

Thao X. Le
12 July 2004



LONG PHAM
PRIMARY EXAMINER